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SEP 25 2007

Application No.: 10/624,901

AMENDMENTS TO THE CLAIMS

1. (Currently amended) An information processing apparatus including a processor that has at least one register and performs processing according to a machine language program, the register retaining data used in computation, the information processing apparatus comprising:

a compression judgment unit operable to judge whether the machine language program has information indicating that the data retained in the register should be compressed and then saved to a stack memory in response to call of a predetermined function; and

a save unit operable to perform a data saving, which is to save the data retained in the register to the stack memory, wherein

when the judgment by the compression judgment unit is affirmative and the data saving is performed in response to the call of the predetermined function, the save unit compresses the data before the data saving,

when the judgment by the compression judgment unit is affirmative and the data saving is performed in response to call of a function that is other than the predetermined function, the save unit performs the data saving without compressing the data, and

when the judgment by the compression judgment unit is not affirmative, the save unit performs the data saving without compressing the data, whether the data saving is performed in response to the call of the predetermined function, or in response to the call of the function that is other than the predetermined function

~~a save unit operable to, when the judgment by the compression judgment unit is affirmative, compress and then save the data retained in the register to the stack memory in response to call of the predetermined function.~~

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2. (Currently amended) The information processing apparatus of Claim 1, further comprising:

a decompression judgment unit operable to judge whether or not there is decompression information indicating that the data saved in the stack memory should be decompressed and then restored to the register in response to termination of the call of the predetermined function; and

a restore unit operable to perform a data restoring, which is to restore the data saved in the stack memory to the register, wherein

when the judgment by the decompression judgment unit is affirmative and the data restoring is performed in response to the termination of the call of the predetermined function, the restore unit decompresses the data before the data restoring, and

when the judgment by the decompression judgment unit is affirmative and the data restoring is performed in response to termination of the call of the function that is other than the predetermined function, the restore unit performs the data restoring without decompressing the data, and

when the judgment by the decompression judgment unit is not affirmative, the restore unit performs the data restoring without decompressing the data, whether the data restoring is performed in response to the termination of the call of the predetermined function, or in response to the termination of the call of the function that is other than the predetermined function

~~a restore unit operable to, when the judgment by the decompression judgment unit is affirmative, decompress and then restore to the register the data saved in the stack memory in response to termination of the call of the predetermined function.~~

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3. (Original) The information processing apparatus of Claim 2,

wherein the decompression judgment unit judges whether the machine language program has the decompression information.

4. (Currently amended) The information processing apparatus of Claim 3, wherein

~~, when the judgment by the compression judgment unit is affirmative, the save unit compresses and then saves the data retained in the register to the stack memory when execution of~~

the save unit performs the data saving in response to the call of the predetermined function when a call instruction for calling the predetermined function is executed, and

~~when the judgment by the decompression judgment unit is affirmative, the restore unit decompresses and then restores to the register the data saved in the stack memory when execution of the restore unit performs the data restoring in response to the termination of the call of the predetermined function when a return instruction for terminating the call of the predetermined function is executed.~~

5. (Currently amended) The information processing apparatus of Claim 3, wherein,

~~when the judgment by the compression judgment unit is affirmative, the save unit compresses and then saves the data retained in the register to the stack memory~~ the save unit performs the data saving in response to the call of the predetermined function when a process for the predetermined function starts, and

~~when the judgment by the decompression judgment unit is affirmative, the restore unit decompresses and then restores to the register the data saved in the stack memory~~ the restore unit

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performs the data restoring in response to the termination of the call of the predetermined function when the process for the predetermined function finishes.

6. (Original) The information processing apparatus of Claim 2,

wherein the save unit, when compressing and saving the data retained in the register to the stack memory, associates the decompression information with compressed data resulting from compressing the data retained in the register, and saves the decompression information and the compressed data in association to the stack memory,

the decompression judgment unit judges whether the stack memory has decompression information that is associated with data saved in the stack memory, and

the restore unit, when the judgment by the decompression judgment unit is affirmative, decompresses and then restores to the register the data associated with the decompression information in response to termination of the call of the predetermined function.

7. (Original) The information processing apparatus of Claim 6,

wherein the save unit comprises:

a data conversion subunit operable to convert first data retained in the register into second data according to a predetermined algorithm;

a comparison subunit operable to compare the data size of the second data with a threshold value that shows compression efficiency; and

a selective save subunit operable to, when the data size of the second data is smaller than the threshold value, save the second data to the stack memory, and when the data size of the second data is greater than the threshold value, save the first data to the stack memory.

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8. (Currently amended) The information processing apparatus of Claim 6, wherein ~~when the judgment by the compression judgment unit is affirmative, the save unit compresses and then saves the data retained in the register to the stack memory when execution of the save unit performs the data saving in response to the call of the predetermined function when a call instruction for calling the predetermined function is executed, and~~
~~when the judgment by the decompression judgment unit is affirmative, the restore unit decompresses and then restores to the register the data saved in the stack memory when execution of the restore unit performs the data restoring in response to the termination of the call of the predetermined function when a return instruction for terminating the call of the predetermined function is executed.~~

9. (Currently amended) The information processing apparatus of Claim 6, wherein ~~when the judgment by the compression judgment unit is affirmative, the save unit compresses and then saves the data retained in the register to the stack memory~~ the save unit performs the data saving in response to the call of the predetermined function when a process for the predetermined function starts, and
~~when the judgment by the decompression judgment unit is affirmative, the restore unit decompresses and then restores to the register the data saved in the stack memory~~ the restore unit performs the data restoring in response to the termination of the call of the predetermined function when the process for the predetermined function finishes.

10. (Currently amended) An information processing method used with an information processing apparatus including a processor that has at least one register and

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performs processing according to a machine language program, the register retaining data used in computation, the information processing method comprising:

a compression judgment step of judging whether the machine language program has information indicating that the data retained in the register should be compressed and then saved to a stack memory in response to call of a predetermined function; and

a save step of performing a data saving, which is to save the data retained in the register to the stack memory, wherein

when the judgment by the compression judgment step is affirmative and the data saving is performed in response to the call of the predetermined function, the save step compresses the data before the data saving,

when the judgment by the compression judgment step is affirmative and the data saving is performed in response to call of a function that is other than the predetermined function, the save step performs the data saving without compressing the data, and

when the judgment by the compression judgment step is not affirmative, the save step performs the data saving without compressing the data, whether the data saving is performed in response to the call of the predetermined function, or in response to the call of the function that is other than the predetermined function

~~a save step of, when the judgment at the compression judgment step is affirmative, compressing and then saving the data retained in the register to the stack memory in response to call of the predetermined function.~~

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11. (Currently amended) A program conversion apparatus comprising:

an acquisition unit operable to acquire an input program that includes one or more functions;

a judgment unit operable to, when (i) data that is retained in a register included in a processor is saved to a stack memory in response to call of a function and (ii) the function called is a predetermined function, judge, from the input program, whether the data should be saved after being compressed or without being compressed ~~judge, from the input program, whether, in response to call of a predetermined function, data retained in at least one register of a processor should be compressed and then saved to a stack memory, or should be saved to the stack memory without being compressed;~~ and

a conversion unit operable to, (i) when the judgment unit has judged that the data should be compressed and then saved after being compressed, convert the input program into an output program that includes indication information, and (ii) when the judgment unit has judged that the data should be saved without being compressed, convert the input program into an output program that does not include the indication information, wherein

when the data is saved in response to the call of the predetermined function, the indication information indicating indicates, to the processor, that the data retained in the register should be compressed and then saved to the stack memory.

12. (Original) The program conversion apparatus of Claim 11,

wherein the judgment unit includes:

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a detection subunit operable to detect a stack access function in the input program, the stack access function referring to the stack memory in which the data in the register have been saved,

and the judgment unit judges that the data retained in the register should be saved to the stack memory without being compressed in response to call of any of the stack access function and functions that position higher order than the stack access function in a hierarchical structure of functions included in the input program.

13. (Original) The program conversion apparatus of Claim 11,

wherein the judgment unit includes:

a pre-specification detection subunit operable to detect a pre-specified function in the input program, the pre-specified function being a function to which information indicating that the data retained in the register should be compressed and then saved to the stack memory has been added in advance,

and the judgment unit judges that the data retained in the register should be compressed and then saved to the stack memory in response to call of the pre-specified function. The program conversion apparatus of Claim 11,

wherein the judgment unit includes:

a nest information creation subunit operable to create nest information that shows a hierarchical structure of functions included in the input program,

and when the predetermined function includes therein a subroutine, the judgment unit judges whether, in response to call of the predetermined function, the data retained in the register

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should be compressed and then saved to the stack memory, or should be saved to the stack memory without being compressed, based on the nest information.

14. (Original) The program conversion apparatus of Claim 11,

wherein the conversion unit includes:

a compression information addition subunit operable to add, to a call instruction for calling the predetermined function, information indicating to the processor that the data retained in the register should be compressed and then saved to the stack memory when the predetermined function is called; and

a decompression information addition subunit operable to add, to a return instruction for terminating the call of the predetermined function, information indicating to the processor that the data saved in the stack memory should be decompressed and then restored to the register when the call of the predetermined function is terminated.

15. (Original) The program conversion apparatus of Claim 11,

wherein the conversion unit includes:

a compression information addition subunit operable to add, to the predetermined function, information indicating to the processor that the data retained in the register should be compressed and then saved to the stack memory when a process for the predetermined function starts; and

a decompression information addition subunit operable to add, to the predetermined function, information indicating to the processor that the data saved in the stack memory should

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be decompressed and then restored to the register when the process for the predetermined function finishes.

16. (Original) The program conversion apparatus of Claim 11,

wherein the conversion unit includes:

a compression information addition subunit operable to add, to the predetermined function, information indicating to the processor that the data retained in the register should be compressed and then saved to the stack memory when a process for the predetermined function starts; and

a decompression information addition subunit operable to add, to the predetermined function, information indicating to the processor that the data saved in the stack memory should be decompressed and then restored to the register when the process for the predetermined function finishes.